Migrating Mission-Critical Application to Cisco Unified Computing System Improves Performance, Lowers TCO

Cisco IT Case Study / Data Center / Migrating Business-Critical Oracle Application from HP Superdome to Cisco® Unified Computing System: As part of its mission to deliver IT as a Service, Cisco IT Global Data Center Program is migrating all applications, network, compute, and storage to a private cloud built on the Cisco Unified Computing System™ and Cisco Nexus® Series Switches. In March 2011, Cisco IT migrated its Quote to Cash systems, based on the Oracle e-Business Suite and Oracle RAC databases, to the Cisco Unified Computing System. Involved with 100 percent of Cisco's US$40 billion in annual revenue, the Quote to Cash systems are mission-critical. This case study explains why and how Cisco IT accomplished the migration, focusing on performance improvements and business benefits. Cisco customers can draw on Cisco IT's real-world experience to plan the migration of their own mission-critical applications to the Cisco Unified Computing System.

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>
> **Seshagirirao Surapaneni, IT Service Manager**

Background

One hundred percent of Cisco revenue flows through Cisco's 65 Quote to Cash applications, which access a 5TB Oracle RAC database. Approximately 2400 Cisco employees in 18 business functions use the applications, and slow performance or outages are unacceptable because they can delay revenue booking.

Based on the Oracle e-Business Suite Order Management and Accounts Receivables modules, the Quote to Cash applications connect to more than 400 other applications used at Cisco. The Order Management application supports Cisco order processing from start to finish, including pricing and product configurations for customer orders. After an order is processed and the product ships, the Oracle Accounts Receivable application processes order discounts, customer billing, and tax management.

Challenge

Cisco IT previously hosted the Quote to Cash systems on an HP Superdome platform. But as transaction volume increased, users began experiencing long delays during month-end and quarter-end close. Some processes took all day. Tax calculations, for example, took approximately 7 hours, and booking 37,000 orders took 6.5 hours.

When Cisco introduced the 32-core Cisco UCS 440 Blade Server, Cisco IT saw an opportunity to improve Quote to Cash application performance by providing more RAM capacity and processing power. Oracle has certified the Cisco Unified Computing System for Oracle RAC 10g and 11g backend databases and the Oracle e-Business Suite.

This would be the first time Cisco IT used Cisco UCS 440 Blade Servers for Enterprise Production System. "We knew it would be crucial to minimize downtime during the migration and avoid issues after go-live, because 100 percent of Cisco revenue flows through the Quote to Cash applications," says Ashok Joshi, Cisco IT architect.

Complicating the challenge, the IT team would be upgrading the application databases from Oracle RAC 9i to Oracle RAC 10g at the same time they migrated the application to the new platform.

Solution

Cisco IT successfully migrated the Quote to Cash systems from HP Superdome servers to Cisco UCS B440 Blade Servers, according to schedule and with zero hardware issues since the go-live date (Table 1). “Having no outages despite a platform change and major database software upgrade is highly unusual,” says Jag Kahlon, IT architect “Users didn’t even notice the transition, except for the faster response time.”

Table 1. Quote to Cash Production Systems Configuration Before and After Migration

	Source (HP Superdome)	Target (Cisco Unified Computing System)
Production Server Configuration	2 HP PA-RISC Superdomes (North America) 2 HP RP8420 Systems (Europe)	4 Cisco UCS B440 Blade Servers (North America and Europe)
Operating System	HP-UX Version 11.11	Red Hat Enterprise Linux Version 5.5
CPU Cores	144	128
Memory	288 GB	1024 GB
Performance	Capacity for current workload	Capacity for double the current workload
Database	Oracle RAC 9i	Oracle RAC 10g

To prepare for business growth, the Cisco IT application team wanted to size the Cisco Unified Computing System for 130 percent of the current application workload. After measuring transactions per second and input/output operations per second, the team determined the Quote to Cash application and database would need four Cisco UCS 440 Blade Servers.

The Cisco Unified Computing System accesses storage arrays through a pair of Cisco UCS 6100 Series Fabric Interconnects. “We only had to connect the system to storage once, and we won’t need to do it again no matter how many nodes we add to the cluster,” says Joshi. With the HP Superdome, in contrast, Cisco IT had to individually cable each new node for data and storage connectivity, increasing operational overhead.

Cisco IT configured the Cisco UCS M81KR Virtual Interface Card to act like multiple virtual Converged Network Adapters (CNAs) for SAN and LAN traffic. High traffic on one virtual interface does not affect performance on the others.

Cisco IT made no changes to Oracle RAC load balancing or queue partitioning. The team tuned the SQL execution plan in accordance with Oracle best practices for Oracle RAC 10g upgrades. Cisco IT did modify the Quote to Cash applications to reduce roundtrips over the WAN, minimizing latency that could otherwise affect the user experience.

Deployment Timeline

To avoid delays in the migration from unexpected issues, Cisco IT conducted a proof of concept, two testing cycles, and a practice run before the go-live date. Testing began in August 2010, and the Quote to Cash applications went live on the Cisco Unified Computing System in March 2011. “During testing, Cisco IT executed 6000-7000 test cases affecting 18 Cisco functions, and performed regression testing,” says Joshi. “One hundred percent of test cases executed successfully.”

Minimizing Downtime

The goal for the migration was reducing the overall downtime during transition to minimize the impact to the business. The team accomplished the goal using the following techniques:

- Set up the disaster recovery program to not copy the database over the WAN during downtime.
- Used Oracle Cross-Platform Transportable Tablespaces (XTTS) technology for migration. “XTTS significantly increases the quality of exports and imports,” says Rajesh Bansal, Cisco IT manager.
- Identified tasks that could be executed in advance, such as setting up the target database and converting it to Oracle RAC 10g.
- Minimized copy time by using optimal parallel threads.
- Parallelized Oracle RAC 10g upgrade tasks, checks, and audits.

Cisco IT developed custom scripts for auditing, to find out quickly if any objects did not migrate.

Coordinating the Migration with Internal Users and Partners

Cisco IT carefully coordinated the migration with Cisco internal users and partners who depend on Quote to Cash applications. Eighteen Cisco functions use the applications, include Buying and Selling Enablement, Corporate Finance, and Customer Value Change Management. “We engaged every business function early in the planning process,” says Bansal.

Cisco IT also contacted almost 90 manufacturing partners who access the system to tell them the new server IP address and which firewall ports to open.

Networking and Security

The fabric interconnects attach to the upstream Cisco Nexus 7000 Switch over 10 Gigabit Ethernet, the standard for all Cisco Unified Computing System deployments at Cisco.

Cisco IT continued to use its existing data center security architecture, without modification. Techniques include access control lists, VLANs, and firewalls.

Results

“This project was the most successful I’ve ever been involved with, which I attribute to close collaboration among the Cisco IT infrastructure team, application performance team, and customer support,” says Joshi.

40 Percent Faster Application Performance

“Since we moved the Quote to Cash environment to the Cisco Unified Computing System, performance for all types of transactions improved by an average of 40 percent,” says Seshagirirao Surapaneni, IT service manager. “Tax calculations that used to take around 7 hours now complete in 1-2 hours.”

Similarly, on HP Superdome, the Quote to Cash application could book 37,000 orders in approximately 6.5 hours. On the Cisco Unified Computing System, the application books 70,000 orders in 3 hours, a 400 percent improvement.

The improved user experience has also reduced trouble tickets, freeing up the IT staff to focus on other projects to improve business competitiveness. “Quote to Cash is a revenue-supporting system, so any performance or availability issue receive top priority,” Bansal says.

Application performance increases result from a combination of factors:

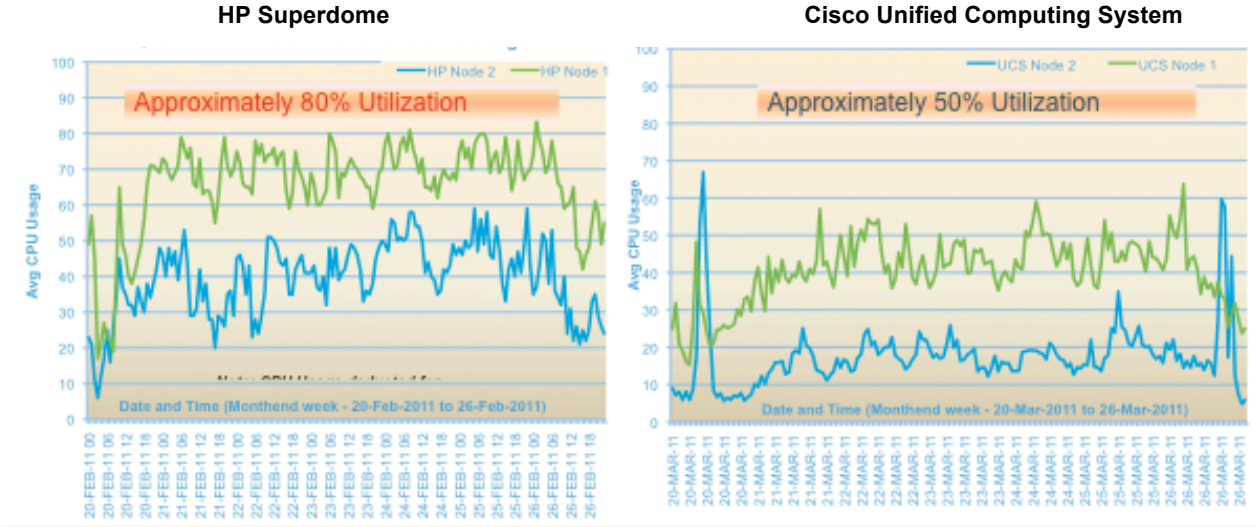
- Migration to the Cisco Unified Computing System. “The Cisco Unified Computing System lets us adjust CPU, memory, and bandwidth allocation over the unified fabric to optimize performance of Oracle RAC 10g,” says Sidney Morgan, Cisco IT architect. “The low-latency fabric also optimizes Oracle RAC 10g performance.”
- Upgrade from Oracle RAC 9i to Oracle RAC 10g.

- Tax software upgrade.

Capacity for Business Growth

More efficient CPU utilization on the Cisco Unified Computing System means the Quote to Cash system can handle twice the workload it could on the HP Superdome (Figure 1). Cisco IT expects the current Cisco Unified Computing System configuration to accommodate anticipated growth for two to three years, at no extra cost.

Figure 1. Comparison of CPU Utilization During the Last Week of February 2011



Faster Online Transaction Response

Figures 2 and 3 show performance improvement for online transactions and batch processing. Users notice the difference: “Initial feedback from our users is that performance has noticeably improved,” says Kahlon.

Figure 2. Faster Online Transaction Response, Shown in Seconds
Performance improvement is shown as percentage. Scale for seconds, on Y-axis, is logarithmic

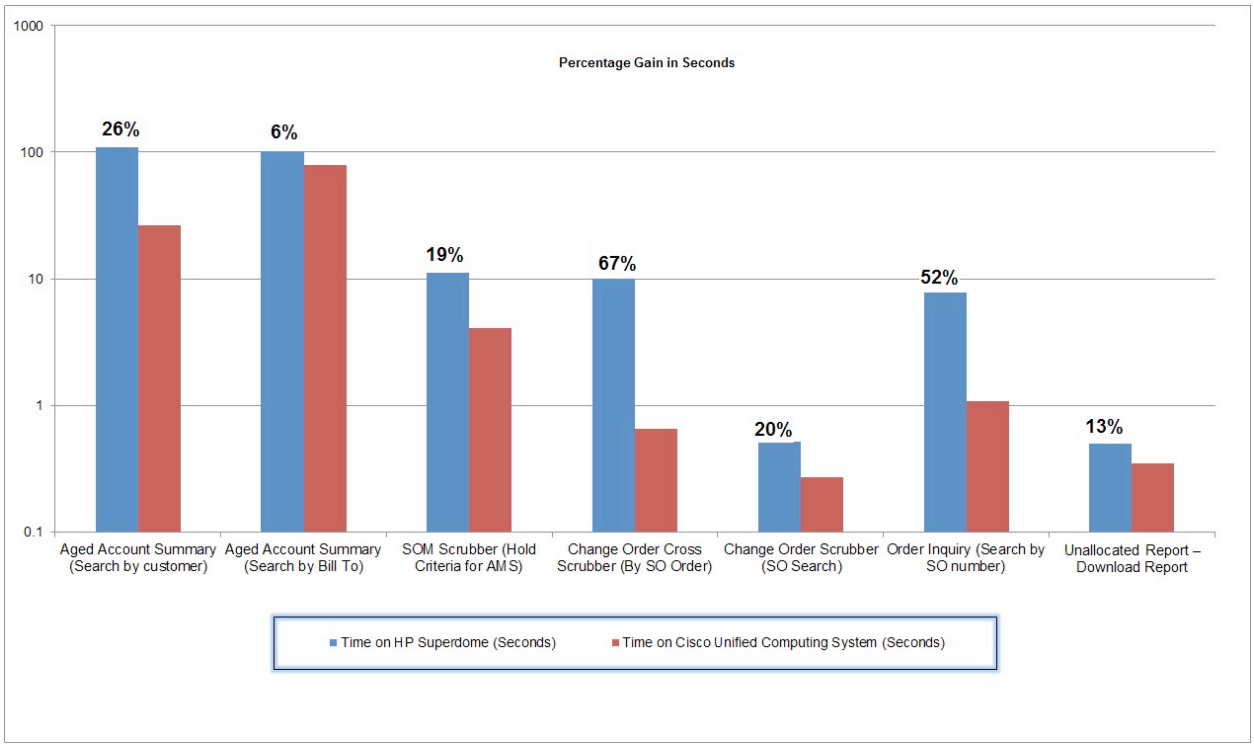
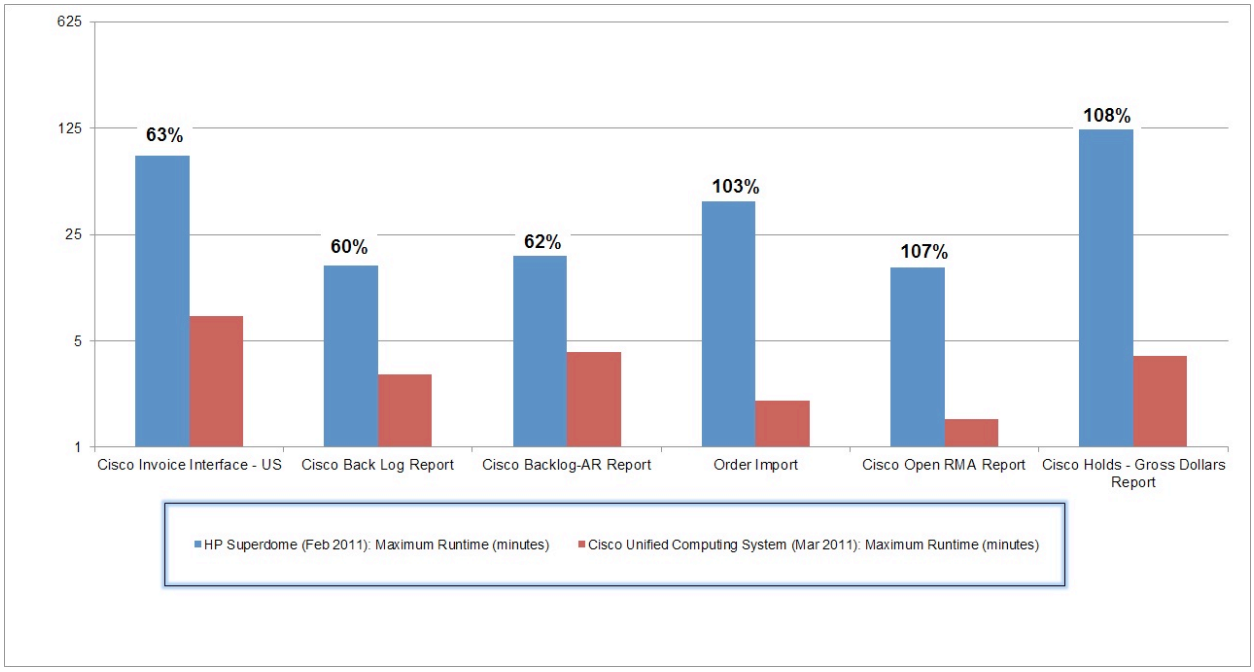


Figure 3. Faster Batch Processing, Shown in Minutes
Performance improvement is shown as percentage. Scale for minutes, on Y-axis, is logarithmic.



Lower Total Cost of Ownership

Factors contributing to lower TCO for the Oracle environment on the Cisco Unified Computing System include:

- **Capital cost avoidance:** Cisco saved 85 percent in capital costs by migrating from the HP PA-RISC

platform to the Cisco Unified Computing System instead of the HP Itanium platform.

- **Lower support costs:** Connecting servers to the data network and storage takes less time on the Cisco Unified Computing System. The server administrator defined service profiles including host bus adapter (HBA) settings and BIOS policies, and just clicks to attach the service profile to new servers. Similarly, if a blade server fails, Cisco IT can apply the service profile to any other available blade in the Cisco Unified Computing System. There is no need to change the configuration of the VLAN or the VSAN because virtual MAC and WWN addresses stay the same.
- **Simplified expansion:** With HP Superdome, adding a node required finding rack space, patching SAN and LAN cables to backend switches, and coordinating with multiple data center teams. “Now adding another chassis is as simple as racking it and connecting the I/O module to the Cisco UCS fabric interconnect and chassis power cables,” says Kahlon. “We no longer need to worry about LAN and SAN settings or cabling.”
- **Lower Oracle licensing costs:** Migrating to the x86 platform and fewer CPU cores reduced Oracle licensing costs by 35 percent.

Increased Resilience

If a Cisco UCS Blade Server fails, Cisco IT can rapidly provision a replacement by applying a Cisco UCS Manager service profile to a different blade. This enables the IT team to restore the Oracle RAC cluster to the original state much more quickly than they could on the HP Superdome platform.

Lower Data Center Space, Power, and Cooling

Table 2 compares the complete Quote to Cash environment on the HP and Cisco platforms, including the four production blade servers, as well as other blades used for development, staging, disaster recovery, and backup, both in the U.S. and Amsterdam. The Cisco Unified Computing System occupies one-sixth the data center space of the HP systems that it replaced, consumes 65 percent less power, and uses 40 percent fewer cables.

Table 2. Comparing Data Center Environment, Including All Supporting Systems

	Source (HP)	Target (Cisco UCS)
Total Servers	12 HP-UX Servers, including Superdome and midrange systems	15 Cisco UCS Servers: B440, B200, and C210
Cable Count	136	82
Data Center Space	12 racks	Less than 2 racks
Data Center Power Consumption	Approximately 50 kW	Approximately 18 KW

Lessons Learned

“This was a perfect execution,” says Bansal. “We knew how long the cutover would take because we performed multiple practice runs, and we knew how the application would behave in the new environment because we did comprehensive load testing.”

Cisco IT offers the following to with other IT teams migrating business-critical applications from HP Superdome to the Cisco Unified Computing System.

- “Make sure the project plan is perfect,” says Joshi. “Factor in the hardware delivery date and the work that the DBA needs to do.” Cisco IT developed a dashboard showing 14 test-cycle environments, detailing tasks for database administrators, system administrators, and networking engineers.
- Use application partitioning to optimize response times, and take advantage of the Oracle RAC interconnect,

especially for load balancing. At Cisco, user requests to the Quote to Cash applications are automatically routed to the closest server, either in Amsterdam or Richardson, Texas.

- Validate the new platform in a non-production environment before going live. Mimic the production environment as closely as possible, including the blade servers and number of uplinks. For databases larger than 2 or 3TB, Cisco IT schedules two or three practice runs.
- Prepare business users to expect downtime. Cisco IT met with business users, including Cisco partners, to determine how downtime would affect their business processes. This enabled them to plan around the migration.

Next Steps

Cisco IT is following a similar process to migrate other mission-critical applications from HP Superdome to the Cisco Unified Computing System, including business intelligence systems and Service Sales and Service Delivery applications.

For these deployments, Cisco IT is using the Cisco UCS M81KR Virtual Interface Card to dynamically assign Ethernet and Fibre Channel bandwidth. “We are implementing QoS to take full advantage of the 10Gbps connections into the unified fabric, providing the precise I/O capacity to optimize Oracle performance,” says Morgan.

For More Information

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Note

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